Section 4
Santee Cooper Load Forecast

The territorial load served by Santee Cooper includes retail sales to the residential, commercial, and industrial customers of Santee Cooper and wholesale sales to Central and two interconnected municipal electric utility systems in South Carolina, the Town of Bamberg and the City of Georgetown. Additionally, Santee Cooper provides off-system wholesale sales to Alabama Municipal Electric Authority (AMEA), Piedmont Municipal Power Agency (PMPA), the City of Seneca, South Carolina, the Town of Waynesville, North Carolina, and the Charleston Navy Base.

The load forecast adopted for use in the 2020 IRP (Load Forecast) was prepared by Santee Cooper in June 2020 and provides projections of customer counts, energy sales, and peak demand for Santee Cooper's retail customers; projections of energy requirements and peak demand for wholesale sales to Central and two interconnected municipal electric utility systems; projections of monthly sales to off-system wholesale customers; and projections of aggregate system level energy requirements and peak demand for 2020 through 2039. As described in more detail in Section 6 of this report, the Load Forecast includes a base case and sensitivity cases reflecting higher and lower territorial load levels based on a wide range of uncertainty in future economic conditions. These sensitivities imply variations in load levels and the number of both existing and new customers served by Santee Cooper over the forecast horizon. Importantly, the range of uncertainty in the load forecasts is of a reasonable magnitude to reflect continued service to existing retail and municipal customers of Santee Cooper and Central throughout the study period for the 2020 IRP.

As described more fully below, forecasts for Santee Cooper's residential and commercial retail loads, the Town of Bamberg, and the City of Georgetown were prepared by GDS Associates, a consulting firm based in Marietta, Georgia. Forecasts for Santee Cooper's industrial retail loads were prepared by Santee Cooper. Separately, Central prepared load forecasts of its members' systems and provided the results to Santee Cooper for inclusion in the aggregate Load Forecast, with adjustments made by Santee Cooper to include certain load that it expects to serve through 2024. Santee Cooper worked with its off-system wholesale customers to establish forecasts of energy requirements and peak demand.

Santee Cooper Residential and Commercial Retail Classes

The forecast of Santee Cooper's residential and commercial retail rate classes is developed based on a system of econometric and hybrid econometric/end-use forecast equations that include key driving variables, such as income, employment, gross product, electricity prices, end use appliance saturation and efficiency, and weather conditions. Economic data are obtained from Moody's Analytics, a widely recognized provider of such data to the utility industry. Electricity price assumptions are based on Santee Cooper projections and reflect the historical and projected trend in average bills by class in real terms. For purposes of the load forecast, the projected trend in real electricity prices is assumed to decline slightly over the forecast period, reflecting that electricity prices are expected to

escalate at a rate slightly below the rate of inflation. Historical and projected appliance saturation and efficiency data are generally based on data developed by Santee Cooper through its periodic residential consumer surveys and data published by the Energy Information Administration in its periodic Residential Energy Consumption Survey (RECS), Commercial Building Energy Consumption Survey (CBECS), and in the Annual Energy Outlook (AEO). Weather data is obtained from the federal government, and weather conditions over the forecast horizon are assumed to be equal to the most recent 20-year average.

The residential class sales forecast is based on forecasts of residential customer counts and average usage. Residential customer counts are forecasted econometrically, as a function of Horry County households, with an adjustment to capture the gradual decline in the percentage of county households actually served by Santee Cooper (i.e., a larger portion of growth occurs in areas served by cooperatives). Residential average use is forecasted using a hybrid econometric/end-use model commonly referred to as a statistically-adjusted end use (SAE) model, which captures several driving variables within three key categories—cooling, heating, and other consumption. These variables capture trends in average income, home size, people per household, average real electricity cost, saturation and efficiency by end use type, and heating/cooling degree days.

For the commercial class, customer counts are forecasted econometrically as a function of total non-farm employment in the region. Commercial sales are forecast in an SAE model framework, similar to residential average use, but capturing trends in non-farm employment, gross product, saturation and efficiency of commercial end uses, and weather conditions.

Importantly, the historical study period that underpins the forecast ended in December 2019, and the economic data from Moody's Analytics was obtained in February 2020, prior to the onset of the COVID-19 pandemic. Santee Cooper monitored the load impacts of the pandemic utilizing weather-normalized analyses of daily metered system loads and monthly metered loads by class and for major customers and developed adjustments to the forecast to capture the extent of estimated impacts and a reasonable recovery pattern over the 2020-2021 period. This results in reduced load levels in those years and higher growth rates over the first few years of the forecast horizon.

Table 4-1 and Table 4-2, below, provide recent historical and projected numbers of customer counts and sales at the retail meter for the major retail classes.

Table 4-1
Historical Customer Counts and Sales to the Residential and Commercial Classes

Year	Customer Counts			Electricity Sales (GWh)		
	Residential	Commercial	Total	Residential	Commercial	Total
2010	134,704	27,780	162,484	1,859	2,132	3,991
2011	136,047	27,434	163,481	1,761	2,076	3,837
2012	138,353	27,267	165,620	1,623	2,013	3,635
2013	140,126	27,517	167,643	1,679	2,011	3,690
2014	142,663	27,690	170,353	1,801	2,050	3,851
2015	145,208	27,564	172,772	1,785	2,059	3,844
2016	147,447	28,019	175,466	1,807	2,059	3,866
2017	151,044	28,294	179,338	1,746	2,013	3,760
2018	154,586	29,202	183,788	1,939	2,045	3,984
2019	158,032	29,787	187,819	1,879	2,004	3,883
Compound Avg. Growth Rates:						
2010-2019	1.8%	0.8%	1.6%	0.1%	-0.7%	-0.3%

Table 4-2
Projected Customer Counts and Sales to the Residential and Commercial Classes

Year	Customer Counts			Electricity Sales (GWh)		
	Residential	Commercial	Total	Residential	Commercial	Total
2020	159,128	31,172	190,300	1,953	1,968	3,921
2021	162,638	31,435	194,073	1,940	2,075	4,015
2022	166,555	32,056	198,611	1,982	2,184	4,166
2023	169,741	32,598	202,339	1,994	2,191	4,185
2024	172,880	33,120	206,000	2,015	2,203	4,218
2025	176,013	33,633	209,646	2,042	2,204	4,246
2026	179,151	34,149	213,300	2,066	2,201	4,267
2027	182,249	34,681	216,930	2,087	2,202	4,289
2028	185,280	35,198	220,478	2,111	2,204	4,315
2029	188,334	35,672	224,006	2,136	2,192	4,328
2030	191,394	36,141	227,535	2,159	2,181	4,340
2031	194,464	36,614	231,078	2,181	2,186	4,367
2032	197,479	37,085	234,564	2,205	2,197	4,402
2033	200,324	37,554	237,878	2,232	2,213	4,445
2034	202,934	38,019	240,953	2,258	2,236	4,494
2035	205,329	38,484	243,813	2,283	2,258	4,541
2036	207,647	38,953	246,600	2,308	2,286	4,594
2037	209,874	39,418	249,292	2,333	2,306	4,639
2038	212,044	39,879	251,923	2,351	2,330	4,681
2039	214,180	40,348	254,528	2,375	2,356	4,731
Compound Avg. Growth Rates:						
2020-2039	1.6%	1.4%	1.5%	1.0%	1.0%	1.0%

Santee Cooper's monthly peak demand associated with the residential and commercial retail classes is forecast econometrically, based on the aggregate sales forecast described above and peak day temperature. Peak day temperatures over the forecast horizon are assumed to be similar to long-term average historical values. Table 4-3 provides projected winter and summer peak demands associated with the residential and commercial retail classes, as delivered to the Santee Cooper distribution system.

Table 4-3
Projected Peak Demand of the Residential and Commercial Classes

Year	Winter Peak (MW)	Summer Peak (MW)
2020	879	815
2021	842	857
2022	895	883
2023	903	892
2024	913	901
2025	922	910
2026	932	920
2027	941	929
2028	951	939
2029	961	949
2030	971	959
2031	981	969
2032	991	979
2033	1,003	991
2034	1,014	1,003
2035	1,025	1,013
2036	1,036	1,024
2037	1,047	1,035
2038	1,058	1,046
2039	1,070	1,058
Compound Avg. Growth Rates:		
2020-2039	1.0%	1.4%

The forecasts of retail sales by class and seasonal peak demand have been reduced for the projected impacts of demand-side management (DSM) programs. Table 4-4, below, provides the projected impacts of both historical DSM activity and expected future activity, excluding demand response programs associated with Santee Cooper's retail load that are currently under development. Projected impacts of historical DSM decline through time based on the gradual aging and replacement of affected end uses. See Section 5, Demand-side Resource Plans, for more information.

Table 4-4
Projected Demand-side Management Program Impacts

Year	Pre-2020 DSM Activity			Future DSM Activity		
	Energy (GWh)	Peak Demand (MW)		Energy (GWh)	Peak Demand (MW)	
		Winter	Summer		Winter	Summer
2020	(279)	(71)	(59)	(12)	(3)	(3)
2021	(256)	(71)	(59)	(29)	(6)	(6)
2022	(244)	(70)	(58)	(44)	(8)	(8)
2023	(211)	(69)	(57)	(55)	(10)	(10)
2024	(194)	(48)	(44)	(64)	(12)	(12)
2025	(180)	(44)	(41)	(70)	(13)	(13)
2026	(155)	(39)	(36)	(75)	(14)	(14)
2027	(131)	(34)	(31)	(78)	(14)	(14)
2028	(104)	(27)	(25)	(81)	(15)	(15)
2029	(73)	(20)	(19)	(84)	(16)	(16)
2030	(38)	(11)	(10)	(87)	(16)	(16)
2031	(18)	(6)	(5)	(90)	(17)	(17)
2032	(4)	(2)	(1)	(93)	(18)	(18)
2033	(4)	(1)	(1)	(86)	(16)	(16)
2034	(4)	(1)	(1)	(80)	(15)	(15)
2035	(4)	(1)	(1)	(75)	(15)	(15)
2036	(4)	(1)	(1)	(73)	(15)	(15)
2037	(4)	(1)	(1)	(70)	(14)	(14)
2038	0	0	0	(64)	(13)	(13)
2039	0	0	0	(58)	(13)	(13)

Santee Cooper has engaged in such DSM programs for many years. As this period of activity far exceeds the study period utilized in the econometric equations that underpin the forecast, it was not deemed necessary to adjust the historical data that formed the basis of the forecast equations for the impacts of DSM.

Santee Cooper Industrial Retail Class

Santee Cooper serves 27 industrial retail customers directly interconnected to its transmission system. The forecast of demand and energy requirements for Santee Cooper's industrial retail class is based on recent actual loads, contracted quantities, expected changes in operations, and input from account representatives. Santee Cooper typically contracts with industrial customers for service under the Santee Cooper Large Light and Power Schedule, which includes an initial term of not less than five years, with automatic two-year rollover terms thereafter. The Load Forecast utilized for the 2020 IRP assumes a range of future load growth projections that is of reasonable magnitude to reflect continued service of the existing Santee Cooper industrial customers throughout the IRP study period.

The largest customers in the Santee Cooper industrial retail class include Nucor Steel (Nucor) and Century Aluminum of South Carolina, Inc. (Century). Nucor has been a customer since 1996, currently

receiving approximately 300 megawatts of power, the majority of which is provided as non-firm power. Century has been a customer of Santee Cooper since 1977, currently receiving approximately 200 megawatts of power, with 25 percent of the load served under Santee Cooper's firm industrial rate schedule and the remainder served under Santee Cooper's customer-supplied power rate schedule pursuant to which Century provides an off-system resource for the power and Santee Cooper transmits the provided power.

Table 4-5 provides projected customer counts, energy sales, and seasonal peak demands and of the industrial load directly served by Santee Cooper, on a delivered basis.

Table 4-5
Projected Industrial Class Sales and Peak Demand

Year	Energy Sales (GWh)	Peak Demand (MW)	
		Winter	Summer
2020	3,762	474	498
2021	4,342	524	619
2022	4,549	562	626
2023	4,159	519	576
2024	4,159	519	576
2025	4,159	519	576
2026	4,159	519	576
2027	4,159	519	576
2028	4,159	519	576
2029	4,159	519	576
2030	4,159	519	576
2031	4,159	519	576
2032	4,159	519	576
2033	4,159	519	576
2034	4,159	519	576
2035	4,159	519	576
2036	4,159	519	576
2037	4,159	519	576
2038	4,159	519	576
2039	4,159	519	576
Compound Avg. Growth Rates:			
2020-2039	0.5%	0.5%	0.8%

Central Load Forecast

Central's forecast is prepared by Central staff and is based on SAE and econometric models similar to those discussed above regarding Santee Cooper's retail load forecast. Central's forecast represents the aggregate forecast for the Central member cooperative loads served by Santee Cooper, with adjustments made by Santee Cooper to include certain load that it expects to serve through 2024. Central's forecasted aggregate requirements include the load of some Central customers billed to Central under Santee Cooper's L-Rate. Table 4-6, below, provides projected aggregate peak demand and energy requirements of Central's load served by Santee Cooper, on a delivered basis.

Table 4-6
Projected Central Energy Requirements and Peak Demand

Year	Energy Requirements (GWh)	Peak Demand (MW)	
		Winter	Summer
2020	14,017	3,295	2,756
2021	14,452	3,283	2,800
2022	14,850	3,321	2,834
2023	15,200	3,378	2,901
2024	15,528	3,437	2,971
2025	15,495	3,434	2,981
2026	15,601	3,470	3,025
2027	15,693	3,495	3,049
2028	15,834	3,524	3,072
2029	15,898	3,548	3,102
2030	15,989	3,570	3,126
2031	16,084	3,593	3,151
2032	16,225	3,619	3,176
2033	16,285	3,641	3,206
2034	16,385	3,664	3,233
2035	16,491	3,689	3,263
2036	16,650	3,720	3,292
2037	16,731	3,747	3,328
2038	16,856	3,777	3,362
2039	16,984	3,809	3,397
Compound Avg. Growth Rates:			
2020-2039	1.0%	0.8%	1.1%

Municipal Customers on the Santee Cooper System

Santee Cooper serves two municipal electric utilities that are connected to the Santee Cooper transmission system, the Town of Bamberg, South Carolina, and the City of Georgetown, South Carolina. Santee Cooper, with the assistance of GDS Associates, prepares a forecast of the municipal systems energy requirements and contribution to the Santee Cooper system peak demand based on an econometric approach. Table 4-7, below, provides projected energy requirements and coincident peak demands for these municipal customers, on a delivered basis.

Table 4-7
Projected Municipal Energy Requirements and Peak Demand

Year	Energy Requirements (GWh)	Peak Demand (MW)	
		Winter	Summer
2020	178	33	36
2021	182	31	37
2022	186	33	38
2023	186	33	38
2024	186	33	38
2025	186	33	38
2026	185	33	38
2027	185	33	38
2028	185	33	38
2029	185	32	38
2030	184	32	38
2031	184	32	38
2032	184	32	38
2033	184	32	38
2034	184	32	38
2035	184	32	38
2036	183	32	38
2037	183	32	38
2038	183	32	37
2039	183	32	37
Compound Avg. Growth Rates:			
2020-2039	0.1%	-0.1%	0.2%

Other Wholesale Sales

Forecasts of wholesale sales to AMEA, PMPA, the City of Seneca, South Carolina, the Town of Waynesville, North Carolina, and the Charleston Navy Base are based either on forecasts provided by the wholesale customers or, in cases where customers do not provide a forecast, Santee Cooper uses historical and market data to develop forecasts for these customers' requirements, which have been included in the aggregate Load Forecast for the duration of each contract term.[1] Table 4-8, below, provides projected energy requirements and peak demand contributions of these customers, on a delivered basis, over the forecast horizon.

[1] Wholesale sales are included in the Load Forecast through the following terms: Charleston Navy Base through May 5, 2020, AMEA through December 2023, Seneca through June 2025, Waynesville through December 2026, and PMPA through December 2029.

Table 4-8
Projected Energy Requirements and Peak Demand of Off-system Sales

Year	Energy Requirements (GWh)	Peak Demand (MW)	
		Winter	Summer
2020	715	192	263
2021	719	173	268
2022	736	179	273
2023	753	186	278
2024	546	143	234
2025	448	150	240
2026	356	132	210
2027	260	116	199
2028	277	122	203
2029	19	0	30
2030+	0	0	0

Aggregate System Requirements

The total system load requirements are derived from a summation of the forecasts above and applicable losses over Santee Cooper's transmission system. Table 4-9, below, provides historical and projected energy requirements and seasonal peak demand for the aggregate Santee Cooper system, including transmission losses, over the forecast horizon.

As discussed above, the Load Forecast includes an expected reduction in 2020 sales of approximately eight percent compared to projections developed in 2019, primarily to account for the projected impacts of COVID-19. This reduction includes a downward adjustment in Central's load for 2020 of five percent. The Load Forecast reflects a reasonable recovery pattern for COVID-19 load reductions over 2020 and2021. In the initial five months following the development of the COVID-19-reduced load forecast (April 2020 through August 2020), weather-adjusted loads appear to be approximately three percent higher than projected.

Table 4-9
Projected Santee Cooper System Energy Requirements and Peak Demand

Year	Energy Requirements (GWh)	Peak Demand (MW)	
		Winter	Summer
2020	22,753	4,951	4,438
2021	23,897	4,932	4,656
2022	24,689	5,071	4,729
2023	24,705	5,101	4,760
2024	24,871	5,127	4,796
2025	24,776	5,140	4,821
2026	24,834	5,168	4,846
2027	24,873	5,187	4,869
2028	25,086	5,233	4,907
2029	24,936	5,145	4,773
2030	25,055	5,177	4,777
2031	25,196	5,210	4,812
2032	25,387	5,247	4,847
2033	25,500	5,281	4,890
2034	25,661	5,316	4,930
2035	25,822	5,353	4,971
2036	26,042	5,395	5,011
2037	26,173	5,433	5,059
2038	26,354	5,476	5,105
2039	26,543	5,520	5,152
Compound Avg. Growth Rates:			
2020-2039	0.8%	0.6%	0.8%

Section 5
Demand-Side Resource Plans

Title 58, Chapter 37 of the S.C. Code of Laws requires Santee Cooper to invest in demand-side management (DSM) and other energy efficiency and renewable energy programs. These are utility-led programs that promote the reduction or more efficient use of energy by utilities, their energy suppliers, and their retail and wholesale customers. These programs include conservation, energy efficiency, load management, and renewable energy technologies. The projected impact in terms of load reductions from these programs are factored into the 2020 IRP, either through reductions in forecast of Santee Cooper's retail loads or as *below-the-line* resources that otherwise reduce the need for supply-side resources.

This section describes and quantifies the Santee Cooper DSM programs and future plans to enhance and expand the programs to continue improving the efficiency of our customers' consumption and reducing the overall cost of power on our system. Importantly, these programs are associated with Santee Cooper's retail customers only. Central and Santee Cooper's other wholesale customers administer similar programs and engage with their retail customers to economically reduce consumption. Hence, the scope of programs discussed herein is limited to the Santee Cooper retail customers, and the estimated DSM savings are associated with that portion of the Santee Cooper system only. The projected savings from the DSM programs being administered by Santee Cooper's wholesale customers are embedded in the load forecasts these customers share with Santee Cooper for use in the aggregate system Load Forecast.[2]

Santee Cooper DSM Overview and Goals

Santee Cooper serves eight wholesale customers, 27 military and large industrial customers, and more than 189,000 residential and commercial customers directly in Berkeley, Georgetown, and Horry counties. The relative proportions of sales to these customers during 2019 are shown in Figure 5-1, below.[3]

Santee Cooper mainly focuses on developing and offering DSM programs to its residential and commercial customers. Santee Cooper's largest wholesale customer, Central Electric Cooperative, Inc., develops, implements, and administers its own DSM programs. Santee Cooper's military and industrial customers independently make energy efficiency improvements based on the measures found to be most feasible for the specialized needs their industries.

[2] Central also expects to increase its demand response resources as discussed in Section 6 under Demand-side Resources.

[3] Residential and commercial sales include interdepartmental sales, which comprise electricity sales to Santee Cooper water system facilities.

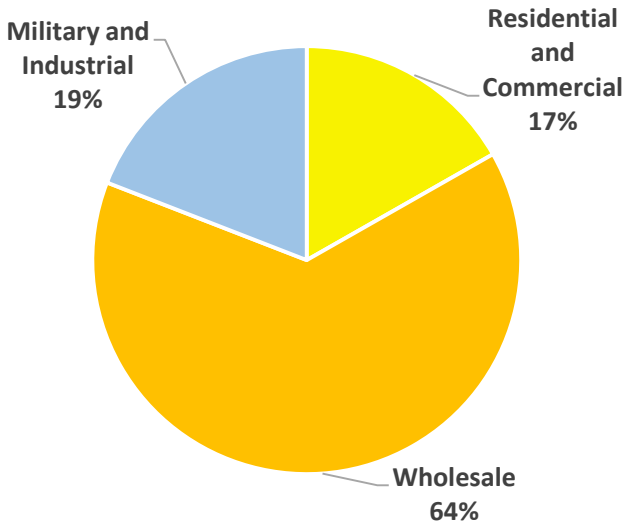

Figure 5-1: Santee Cooper Customer Energy Sales Mix

Santee Cooper has offered DSM programs for decades. Most recently, its retail customer base has benefited from the Santee Cooper DSM plan and portfolio of programs called *Reduce the Use*, which was active through 2020 and included a variety of both commercial and residential programs. In 2008, the Santee Cooper Board of Directors set a goal to reduce energy consumption by 209 gigawatt-hours by 2020, which was the basis for choosing the portfolio of DSM programs to include in the Reduce the Use plan. With the Reduce the Use plan meeting its energy reduction goals by 2018 and coming to a successful conclusion in 2020, Santee Cooper designed and implemented a successor DSM plan that will continue to serve its retail customers by empowering them to take steps to further improve their energy efficiency, establish solutions for peak demand load control, and support electric vehicle adoption through rebate initiatives. This portfolio of DSM programs, called *EmpowerSC*, embraces new technologies and focuses on the needs of our customers.

The EmpowerSC plan is comprised of voluntary load management programs, beneficial electrification, residential and commercial energy efficiency programs, and solar power offers, and provides for inclusion of new technologies, when appropriate. Santee Cooper's goal for the EmpowerSC plan is to save an additional 100 gigawatt-hours by 2030. The EmpowerSC plan is structured to be customer-focused, diversified, continuously improving, and transparent. Additionally, flexibility and responsiveness have been built into the EmpowerSC plan through the expectation of continuous evaluation and adaptation to best meet customer needs, as well as take advantage of market opportunities and technology advances.

Current DSM Offerings

Santee Cooper's Smart Energy portfolio includes all its residential and commercial smart energy programs in one portfolio. Although program qualifications and participants vary by program, all Santee Cooper programs are measured and evaluated at a portfolio level.

Residential Programs

Smart Energy Loans

In addition to loans for renewable energy resources, Santee Cooper offers on-bill financing for energy efficient upgrades. A qualifying customer can secure an outstanding loan of up to $20,000 for energy-efficiency and $40,000 for renewable energy resources. The combined maximum outstanding loans per customer cannot exceed $40,000. Customers receiving Smart Energy Loans can also receive rebates on qualifying equipment through the Reduce the Use residential programs. To prevent double counting, the savings from the installations are tracked as part of the rebate program, although many of the equipment upgrades would not be possible without the assistance of the Smart Energy Loan.

Smart Energy Existing Homes Program

The Smart Energy Existing Homes Program offers home energy evaluations, incentive rebates and financial assistance through low cost loans for residential energy efficiency improvements to improve the energy efficiency of customers' homes year-round. Santee Cooper provided rebates to 1,184 customers in 2019, totaling $337,211, with estimated savings of 1,577 megawatt-hours. Table 5-1 provides the numbers of rebates and rebate levels for the rebate measures in this program for 2019. The rebate level for the heat pump measure depends on a variety of factors, including efficiency level and application (single- versus multi-family).

Table 5-1
Smart Energy Existing Homes Rebate Activity During 2019

Measure	Quantity	Incentive
Duct Replacement	148	$500
Heat Pump Water Heater	20	$400
Smart Thermostat	744	$50
High efficiency heat pump	849	$80 - $700

Equipment and Lighting Incentives: Residential LEDs

As prices continue to drop, LEDs have become a cost-effective lighting solution. LEDs last 20 times longer than incandescent bulbs, produce over 75 percent less heat, use over 75 percent less energy, and are available in different sizes and shapes to fit in almost any fixture. Santee Cooper energy advisors gave away 11,142 LED bulbs to 2,500 residential customers, yielding annual energy savings of 846 megawatt-hours.

Santee Cooper Residential Energy Advisors conduct site visits to perform *Home Energy House Calls*. During a House Call, the Energy Advisor evaluates the efficiency of the home and makes recommendations on opportunities to make the home more energy efficient and comfortable. During these site visits, 706 customers received a *Home Energy House Call Kit* that included LED bulbs,

faucet aerators, an LED night light, and, where needed, pipe wrap for water heaters. The estimated annual energy savings total 105 megawatt-hours.

Smart Energy New Homes Program

The Smart Energy New Homes Program offers rebates to builders who construct homes that meet Santee Cooper's eligibility requirements and either meet Smart Energy New Homes performance path criteria or include qualifying equipment. There are three tiers of energy efficiency standards for the single-family performance pathway and two tiers for multi-family.

- **Tier 1**: Achieve a Home Energy Rating System (HERS) Index of 65 or below, which requires homes to be 35 percent more energy efficient than a standard new home. The rebate for this tier is $3,000 for single-family homes and $1,400 per unit for multi-family homes.
- **Tier 2**: Achieve a HERS Index of 75 or below, which requires homes to be 25 percent more energy efficient than a standard new home. The rebate for this tier is $1,600 for single-family homes and $400 per unit for multi-family homes.
- **Tier 3**: Achieve a HERS Index of 85 or below, which requires homes to be 15 percent more energy efficient than a standard new home. The rebate for this tier is $800 for single-family homes only.

Under Tier 1, 94 new single-family homes and 186 multi-family homes were built during 2019 for annual savings of 979 megawatt-hours. Under Tier 2, 125 new single-family homes and 5 new multi-family homes were built for annual savings of 356 megawatt-hours. Under Tier 3, 1 new single-family home was built for annual savings of 2 megawatt-hours.

There were 9 single-family homes that Energy Star qualified, which resulted in a higher HERS Index rating overall. There were 220 new single-family homes that received an LED Bonus for installing more than 50 percent of household lighting with new LED Energy Star bulbs. The total combined incentive cost was $764,860.

On-site Energy Assessments

Santee Cooper offers free energy assessments to residential customers, upon request. In 2019, 260 residential energy assessments were completed.

Commercial Programs

Commercial Prescriptive Program

The Commercial Prescriptive program is a predefined rebate program with established qualifications and associated rebates. This comprehensive platform includes specific cost-effective energy-efficiency measures and associated rebates for commercial improvements. Projects with qualified improvements are eligible for rebates under the Commercial Prescriptive Program. In 2019, 167 projects were funded, saving an estimated total of 9,548 megawatt-hours annually, at a total combined incentive cost of $425,940.

Commercial Small Business Energy Saver Program

Santee Cooper determined that small business customers have limitations that make it hard to participate in traditional energy efficiency programs. These customers typically have little to no time to research options, have little upfront capital, are not equipped to perform economic evaluations of energy efficiency measures, and have no resources to manage a project. As part of the EmpowerSC plan, Santee Cooper wanted to create a program offer that would be more inclusive and targeted to this segment of customers to help address these issues. Santee Cooper implemented a Small Business Direct Install program, in which an implementation contractor, Lime Energy™, sells projects to our small business customers. After selling the project, Lime Energy then procures the materials and equipment and has the measures installed by licensed contractors, creating a seamless experience for the customer. In 2019, 455 customers participated in this program for a combined savings of 4,140 megawatt-hours and a combined incentive cost of $434,009.

On-site Energy Assessments

Santee Cooper offers free energy assessments to commercial customers, upon request. In 2019, 485 energy assessments were completed.

Load Management

Direct Load Control

Santee Cooper has not had an active direct load control program for many years. However, as discussed further below, Santee Cooper is working to implement a demand response program involving residential and commercial heat pumps and water heating end uses that is expected to function in a similar way to legacy direct load control programs but with two-way communication, more complex control options, greater participant engagement and available options, and end use data collection.

Time-of-Use or Seasonal Rates

Santee Cooper offers time-of-use rates for residential and commercial customers, with the rate for the latter being seasonal. These options have been offered for many years, currently with three residential and 25 commercial customers.

Standby Generation Incentives

Santee Cooper has historically offered a generator lease program. The decision was made to close this program to new participants in 2014. Santee Cooper continues to actively service the generators remaining in the lease program until the term of those leases expire. The program has 57 participants leasing a total of approximately 11 megawatts.

Voltage Reduction

Santee Cooper has installed a Conservation Voltage Reduction (CVR) application which allows for the reduction of distribution system peak demand. The CVR application and the associated

supervisory control and data acquisition (SCADA), regulator controls, and metering upgrades have been completed in the Horry, Georgetown, and Berkeley areas. By the end of 2019, a total of 253 feeders were complete and ready for CVR. When CVR is enabled, SCADA will direct the station regulators to lower the feeder voltage until the end-of-line meters reach the lower end of the American National Standard Institute (ANSI) required range. If voltage starts to drift too close to the lower limit, SCADA directs the regulators to increase the voltage. Voltage delivered to service points must fall within an acceptable ANSI range, and the application configures the system to deliver the lowest possible voltage while staying within that range. This operational efficiency results in an overall reduction of electric demand. Results from our CVR pilot study support an expected demand reduction on the order of two percent of our distribution system's peak load. Although it will vary by month, Santee Cooper is currently able to achieve between 17 megawatts and 21 megawatts on a typical summer or winter peak. These anticipated reductions are not reflected in the forecast of Santee Cooper's retail loads being utilized for the 2020 IRP and are instead reflected within the demand response capability shown as supply-side resources.

Public Information

Web-Based Customer Tips & Tools

Santee Cooper offers online energy saving tips for residential and commercial customers. We have a partnership with EnergyEarth to offer residential customers a free, online home energy audit. The online, personalized home energy checkup helps customers identify opportunities to be more energy efficient in their homes, which can reduce energy consumption and lower utility bills. The process is easy, progress and results can be saved, and when the audit is finished, suggested products that can help lower energy use are made available for customers to purchase. There is no purchase required to complete the home energy checkup and get personalized energy-saving tips.

Direct-to-Customer Communications

Santee Cooper communicates directly to customers to support all of our energy efficiency, conservation and DSM activities and programs. Our monthly bill inserts highlight new programs and include clear, measurable calls to action. We also use direct mail promotions and education collateral. For customers that have opted-in to e-mail notifications, we send monthly information and links to sign up for programs and submit program and participation questions that are answered by our Energy Advisors and engineers. At the end of 2019, the opt-in email program included 88,457 residential and commercial customers, and our direct mail numbers vary according to the target audience for each specific program.

Public Campaigns

Santee Cooper continues to use advertising and communications vehicles that target specific customers and customer groups. We advertise and promote our programs primarily through digital advertising on the web and through social media, which is highly measurable and lets us know who we are reaching and how they are responding. We analyze and measure performance of

communications, allowing us to quickly adjust promotions to achieve better results with our customers and other public stakeholders. We also promote programs through traditional advertising such as outdoor, radio and print ads, as well as press releases and press conferences. In addition, we are partnering with customers who can help spread the word, such as large property managers who help us promote energy efficiency to their property owners.

School Programs & Resources

Through educational initiatives, Santee Cooper has established a strong, collaborative network with school districts in the state to provide educators and students with a real-world understanding of the sources and uses of electricity as well as the importance of conserving and using energy efficiently. Through our business and education partnerships, Santee Cooper is continually supporting the needs of students, teachers, and parents. The following describes the programs in place for ongoing community education and involvement in the energy efficiency and conservation aspects of Santee Cooper's operations.

- **Energy Educators Institute.** Each summer, Santee Cooper sponsors the Energy Educators Institute, a graduate level course for certified South Carolina K-12 teachers and administrators. Ninety educators explore the scientific concepts of energy, its sources, use and impact on the environment, economy and society. Since 1988, over 2,130 South Carolina educators have attended the Institute and have received relevant curriculum-based materials to enhance their teaching in areas such as energy efficiency and conservation.
- **Educational Publications.** Approximately 25,000 curriculum-based environmental/energy conservation publications (K-12) are sent to teachers in the state each year. These publications educate teachers and students about environmental issues such as the importance of *Reduce, Reuse, and Recycle,*—how renewable resources can play a part in the generation of electricity, and the need to develop life-long practices to conserve energy wisely.
- **Solar Schools' Project/Conservation of Energy Curriculum.** Santee Cooper's Solar Schools Initiative in 2007 led to the development of the Conservation of Energy science curriculum kit now being taught to all sixth-grade students in 32 middle schools in South Carolina. Teachers are trained each summer (over 150 to date) on the Conservation of Energy curriculum, equipping them with the scientific knowledge needed to understand the opportunities and limitations associated with renewable power sources, as well as the need for societies to develop lifestyles that embrace the efficient use of energy.
- **E-SMART Kids.** This interactive website is a tool to inspire teachers, students, and parents to be *green*. The intent of the website is to bring awareness and understanding about the need to be energy efficient and the steps each individual can take to prevent energy waste. Also available on this site is a link for teachers and parents to learn how Santee Cooper's green initiatives can help make homes, schools and businesses operate in a more energy efficient manner.

- **Environmental Bookmarks.** Santee Cooper's energy conservation message is also delivered through the distribution of bookmarks, Live the Good Life and Make an Impact, (over 76,000 through 2019) at educational and community venues, such as career day events, classroom presentations and environmental fairs. The green tips shared on the bookmarks are a daily reminder to students, parents, and community members on the actions they can take every day to use energy more wisely.

Future DSM Programs and Program Updates

Demand Response

Santee Cooper is currently developing a demand response program for its commercial and residential customers. The program will initially be utilized to reduce demand during reliability events but will eventually be used for peak shaving. The program will begin as a residential pilot program, which, upon successful completion, will roll into a full-scale program. A commercial pilot and, ultimately, full-scale program will follow. The program initially is planned to control customers' electric heating systems and water heaters during electric system reliability events. This program will emphasize the customer experience, including efforts to manage customer convenience as well as high-quality marketing and communication to inform our customers about the reason for needing a demand response program and how Santee Cooper is striving to ensure that our customer's inconvenience during a called event is minimized. The program will provide customers with information about why an event was called and pay them incentives for their participation. The goal for this program is to have 35 megawatts of demand response by 2027.

This customer-focused program will work in tandem with conservation voltage reduction and Volt-VAR optimization capability that Santee Cooper has been developing, which is currently estimated to be capable of reducing the system peak by 18 megawatts. Santee Cooper expects to be able to increase the capability of the voltage reduction and Volt-VAR optimization program to 26 megawatts by 2027. The impacts of these demand response programs are not reflected in the forecast of Santee Cooper's retail load that has been utilized for the 2020 IRP.

Electric Vehicles

Santee Cooper is developing and implementing an electric vehicle (EV) program. The program has two focuses—internal advocacy of EVs and customer programs. Santee Cooper believes that internal advocacy of EVs will be a driving factor in the success of the EV programs. Therefore, Santee Cooper wants to understand EVs from users' perspectives to better serve customers. Santee Cooper's approach to internal advocacy will include:

- **Replacing Santee Cooper Fleets:** Fifty FleetCarma telematics devices are being rotated throughout Santee Cooper's light duty fleet vehicles. These devices capture real-time driving patterns, such as the number of trips, trip length, and miles driven. FleetCarma analyses the data from these vehicles and determines whether the driving patterns associated with each vehicle conform with those of plug-in hybrid electric vehicles (PHEV) or battery-powered electric vehicles

(BEV). Results of the analyses are summarized in a report that provides recommendations on the type of EV that is most appropriate for each fleet vehicle's given driving pattern. In 2020, Santee Cooper has purchased four BEVs and envisions replacing at least 60 fleet vehicles over the next ten years with BEVs and PHEVs.

- **Santee Cooper's Level 2 Charging Infrastructure:** Santee Cooper is installing level 2 charging infrastructure for its EV fleet vehicles, employees that purchase EVs, and customers with EVs. By December 2020, two level 2 charging heads for fleet vehicles and two for employees and customers will be installed at Santee Cooper's main office complex in Moncks Corner. There will also be two level 2 charging heads for fleet vehicles and two for employees and customers installed at Santee Cooper's Horry-Georgetown Division headquarters by December 2020. The North Myrtle Beach Service Center will have one level 2 charging head for fleet vehicles and one for employees and customers. Santee Cooper will continue to build out this infrastructure to aid EV owners.
- **Residential Level 2 EV Charging Incentive:** Santee Cooper's EV residential customer program will begin on December 1, 2020, incentivizing the installation of level 2 charging stations at customers' homes. The incentive is designed to offset a portion of the cost of the EV charging infrastructure sufficient to encourage customers to purchase EVs. The first fifty customers who install qualified, networked, level 2 charging stations will receive a rebate of $500. Any projects submitted after the first 50 rebates have been or will be eligible to receive a $250 rebate.
- **Commercial Level 2 EV Charging Incentive:** Santee Cooper's commercial customer program for level 2 fleet charging station incentives is planned to begin in late 2021.
- **Commercial customer EV Fleet Replacement Incentive:** Santee Cooper plans to initiate a program to incentive commercial customers to replace gas-powered fleet vehicles with EVs that will begin in 2022.

Commercial and Residential Energy Efficiency

Using the results of a DSM Market Potential Study conducted for Santee Cooper by Nexant, Inc., in August 2019, Santee Cooper has implemented additional measures as part of its commercial and residential energy efficiency programs. The Potential Study produced both a low and high estimate of potential for these programs. After consideration of the specific measure parameters and analysis of potential adoption rates, Santee Cooper decided to adopt the high case estimate to inform its DSM implementation goal. The resulting DSM program updates include a significant expansion to the residential multi-family measure offerings and additional residential single family and commercial measures to better meet customer needs and match offerings of comparable utilities. New and modified DSM measures for residential include air source and geothermal heat pump systems, household appliances, pool pump motors, thermal envelope measures (e.g., insulation and air sealing), and smart thermostats. Expanding and adapting these incentives to multi-family homes expands our programs' reach into a large segment of our residential customer base. New and modified DSM measures for commercial customers include lighting, refrigeration, water pump motors, and variable frequency drives.

DSM Program Savings for Retail Customers

Table 5-2 provides the cumulative participants and current level of estimated savings, including transmission and distribution losses, from customers that have participated in Smart Energy Portfolio DSM measures, excluding the Good Cents program.

Table 5-2
Smart Energy Portfolio Savings (Excluding Good Cents)[4]

Class	Cumulative Participants (2009-2019)	DSM Savings (at Generation)		
		Annual Energy (MWh)	Winter Demand (kW)	Summer Demand (kW)
Residential	73,028	66,802	8,215	8,215
Commercial	6,822	201,224	36,290	36,290
Total	79,850	268,026	44,505	44,505

Table 5-3 provides the current level of estimated savings, including transmission and distribution losses, from customers that have participated in the Good Cents program.

Table 5-3
Current Level of Estimated Savings from the Good Cents Program[5]

Class	DSM Savings (at Generation)		
	Annual Energy (MWh)	Winter Demand (kW)	Summer Demand (kW)
Residential	25,173	17,660	29,938

Table 5-4 provides the estimated incremental savings, including transmission and distribution losses, from DSM activity projected for 2020.

Table 5-4
Projected Incremental DSM Savings for 2020

Class	DSM Savings (at Generation)		
	Annual Energy (MWh)	Winter Demand (kW)	Summer Demand (kW)
Residential	2,632	2,724	2,724
Commercial	9,474	676	676
Total	12,106	3,400	3,400

[4] Incentive measure lives have been accounted for.
[5] Good Cents is a discontinued program from which continued load reduction benefits are expected until the end of 2022, when the useful lives of the affected end uses of this program expire.

Table 5-5 provides historical and projected incremental savings, including transmission and distribution losses, from DSM activity over the forecast horizon, excluding demand response programs associated with Santee Cooper's retail load that are currently under development. As a large portion of the DSM activity corresponds to lighting measures, which tend to be largely or wholly off-peak, the implied load factor of the estimated DSM savings can be higher than 100 percent and varies considerably over this period depending on the relative extent of lighting measures.

Table 5-5
Historical and Projected Incremental DSM Savings

Year	Annual Energy (MWh)	Peak Demand (MW)
2011	17,872	1.6
2012	13,965	2.8
2013	24,721	4.2
2014	24,284	4.6
2015	27,915	5.7
2016	31,776	5.9
2017	35,836	8.1
2018	20,221	4.9
2019	18,517	4.7
2020	12,133	3.4
2021	17,959	2.8
2022	15,824	2.5
2023	12,563	2.0
2024	9,145	1.6
2025	6,496	1.2
2026	4,716	0.9
2027	3,746	0.8
2028	3,220	0.7
2029 and beyond	2,968	0.7

The decline in incremental energy savings is generally a function of market saturation of economically feasible energy efficiency measures given current technologies and the impact of evolving building codes and appliance standards, which themselves are designed to drive implementation of economic energy efficiency improvements. Santee Cooper periodically performs DSM potential studies, like the study completed in 2019, and will revise future plans and projections as appropriate.